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Project Title : INDOOR NAVIGATION WITH HAZARD DETECTION USING AUGMENTED REALITY.

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Augmented Reality, Indoor Navigation, Hazard Detection, SMTP Mail server.

1. Introduction/Background :

The availability of cheap, globally available technology supporting current positioning through GPS has been a major driving force in the popularity of navigation applications for mobile devices. The fact that GPS does not give an idea about the current altitude, lies as a major obstacle to Indoor Navigation. We conducted an activity-based navigation approach, in which users are prompted to perform a list of activities, such as “take the stairs up one floor then walk north 50 steps” to get to their destination. Brush et al. also state that activity-based navigation is “an interesting alternative to map based navigation or indoor localization systems because it does not require that a map be provided or constructed” . This research concludes that using a step-counter was not particularly helpful while performing activity-based navigation. In this Research the participants also indicated that the step counter used on its own, or in conjunction with pictures of an environment, caused significant frustration while performing activities. We can use Computer Vision systems that rely on marker-based algorithms to estimate the position of the user. AR Navigation is the new phase of indoor mapping where all the expectations are met.

2. Objectives :

- An unity application that helps in indoor localization and assists users that need help navigating within the indoor structure.
- Identity hazard and risk factors that have the potential to cause harm.
- A* algorithm used for finding the shortest path.
- Use of Google mails to pass messages within an android application regarding the coordinates of indoor location where the Hazard has been caused.

3. Methodology:

Figure 1 shows the proposed System

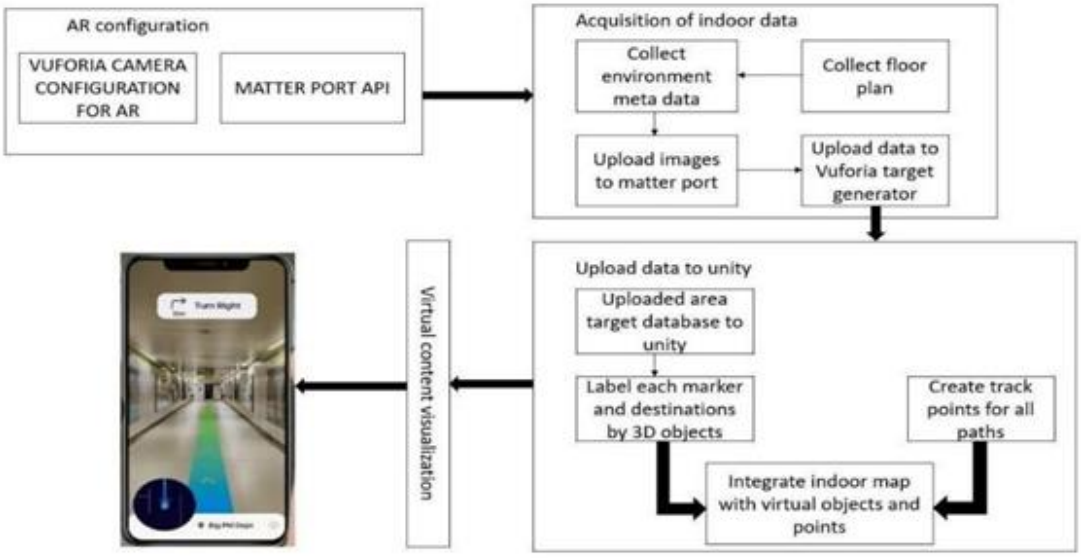

Figure 1: System Architecture.

Implementation steps are as follows:

Step 1: User Interface

*User interface consists of exit, start and dropdown

* quitApp() is used for exit ,add( ) function is used add choices to dropdown and

*dropdownItemSelected( )- the value of selected destination is assigned to index object.

*to_state_controller: Used to pass the dropdown selected value from the main scene to ARscene.

Step2: Destination Pin

*we use SetActive(false) function to first hide all the destination pins and then we use destination variable to set the correct destination pin active (setActive(true)).

Step3:Add navmesh and navmesh agent

*ShowMesh() this function creates a walkable surface which can be viewed at runtime by using using Navmesh data.

Step 4:Collision

*OnTriggerEnter() is used to play audio when user reaches the destination using function audiosource.play().

Step 5: Line Render

*To implement the sequential execution of path render we use StartCouroutine() function and within this function we call drawpath(NavmeshPath object) function wich take NavmeshPath object as argument.

*Within update funciton we also calculate the Navmesh path using Navmesh.CalculatePath(source, destination, navmesh) function.

Hazard Detection:

*sender_script: This script we mention sender email address,sender password and receiver e-mail.

*Simply SMTP client available within unity or WWW request to a php script within a server can be made to sent the mails.
*message_sender() is used to send the Email to the SendAnEmail along with the coordinates of hazard detected.
*SendAnEmail() is used to set up the mail server and send the mail to the admin.and also notifies to the user does the mail is successfully send or not in unity.
*At onTargetFound parameter of the image target we assign sender_script mentioned above and We also use an AudioScript object wich outputs the audio whenever image targets are detected.

4. Results:

Figure 2: Selecting destination from dropdown.

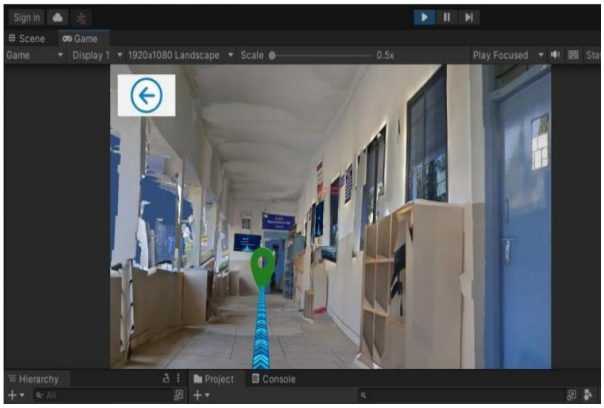

Figure 3: Naviagtion path and destination.

Figure 4: Weapon marker for hazard identification.

Figure 5: Fire marker for hazard identification.

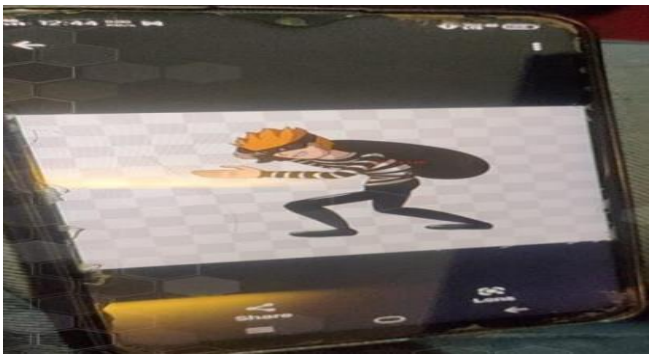

Figure 6: Thief marker for hazard identification.

Figure 7: Mail Received when hazard is detected.

5. Conclusion:

GPS being the key component in navigation systems is replaced by accelerometer and gyroscope for navigation purposes. The application allows the user to track the exact location of another user and also to guide a user from a source end to destination end in an indoor environment. The use of AR to provide navigation is shown to have a clear advantage over the use of paper maps, particularly in complex navigation tasks over multiple floors. During navigation, directional information of the place where hazards were found was presented to the user via both the visual channel. Authorized User can receive information of location to navigate and message is sent through Gmail. In future implementation AI and IOT can be combined with AR for better detection of hazard.

6. Innovation in the project:

- Hazard detected location is sent to the Authorized person through mail.
- Sound alert is given to the user when hazard is detected.
- Automatic localization of the device by using AR Core and computer vision techniques.
- A* algorithm is used to calculate the shortest walkable path to reach destination in indoor environment.

7. SCOPE FOR FUTURE WORK :

Hazards: In the future work the coordinates sent to the authorized mail can be used for indoor navigation To reach a hazard detected place. In future implementations AI and IOT can be combined with AR for better detection of hazards. CNN algorithms can be used for detecting the face of a particular thief.

Hospitals : Indoor navigation is very helpful to visitors, patients, and employees in a hospital. Visitors and patients trying to find their destinations is problematic for hospitals. Turn-by-turn navigation can relieve the stress of navigating the typical labyrinth of hospital hallways, especially in an already stressful or time-sensitive situation. Even hospital staff are often challenged to find the equipment they need, such as IV pumps and medication carts.

Office buildings: Finding a conference room, restroom, or desk can be easy with indoor navigation in smart offices. More than just finding a conference room, employees can find which conference rooms are empty and available. In addition to people and places, assets such as printers, tools, or test equipment can be located. Maintenance personnel can find the printer, wiring closet, or HVAC system that needs service. Data that IPIN systems gather in an office can be very useful.

Shopping malls and large stores: The obvious use of indoor navigation in malls is to get turn-by-turn directions to a particular store. In large stores, it can lead you to specific products. You can also collect useful marketing data from indoor navigation systems. For example, how much time do people spend in each store? What areas of the store do people most often need directions to? With this information, you can make popular items or stores easier to find (or even reconfigure the store layout, based on what people need the most). Proximity marketing is also made possible with indoor positioning.

University campuses: Universities are starting to deploy smart campus technologies. A smart campus uses networked technologies to facilitate collaboration, use resources more efficiently, enhance security, save money, and make the campus a more connected and enjoyable place. Indoor navigation helps to create a more personalized campus experience for both students and visitors.